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BULLETIN  
OF THE  
TORREY BOTANICAL CLUB

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The genus *Costus* in Central America

W. W. ROWLEE

(WITH PLATES 12-15)

As at present organized the genus *Costus* L. is composed of about one hundred species, divided almost equally between the Eastern and Western Hemispheres. Very few species occur in both hemispheres. The American species are most abundant in regions of heavy rainfall, maximum humidity and high temperature of both air and soil. The genus ranges from one Tropic to the other; it occurs wherever conditions are favorable in hot, warm and temperate regions, but is not found in high and cold districts.

In any given locality the species do not usually appear abundant, but are scattered about in deep woodlands and undisturbed jungle. The plants are herbaceous perennials with spirally arranged leaves. The stems or culms are simple and represent branches arising from a system of underground rootstocks. They thus form gregarious clusters, some of the culms remaining sterile and others producing spikes of flowers. In some cases the mats are more extensive than in others, this depending partly upon age and partly upon the habit of the plant. The leaves are ovate to lanceolate in outline and invariably entire.

In Spanish American countries members of the genus are called "canagria" or "cana agria," meaning "bitter cane,"

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all jointed and unbranched stems being known as "cana" and the tissues in the present instance being very bitter. The plants are fleshy throughout their whole body structure, and their tissues are saturated with water, so that it is difficult to make satisfactory herbarium specimens. Certain parts of the plant and especially the spikes are so saturated as they grow in the field that it is easy to wring water from them. In drying they change their form markedly, and it is therefore most desirable to make observations on specimens growing under natural conditions. The flowers in many cases are delicately colored and become fragile when pressed.

The genus *Costus*, together with two or three other genera, belongs in the subfamily Costoideae of the family Zingiberaceae, the group being very distinct in its general characteristics from the other genera of the family. Two types have been recognized in the genus: in the first the floral spike is borne upon what may be called a normal leafy culm; in the second the floral spike develops upon a modified culm. In the first type the culms are designated as "not diverse;" in the second, as "diverse."

The species heretofore recorded from the Western Continent outside of South America have all belonged to the group in which the culms are not diverse. In the present paper two Central American species with diverse culms are reported and proposed as new. They are not closely related to each other, but each is represented by allied species in South America. The paper reports in addition an undescribed species from Central America in which the culms are not diverse and discusses the previously described Central American species.

#### Key to the Central American species

- A. Culms diverse, the spikes borne on short bracteate scapes.
  - B. Bracts of spikes with foliaceous appendages (Costa Rica)..... 1. *C. bracteatus*
  - BB. Bracts of spikes not appendiculate (Guatemala)..... 2. *C. sepacuitensis*.
- AA. Culms not diverse, the spikes borne on ordinary leafy ones.
  - B. Bracts of spikes with foliaceous appendages.
    - C. Spikes ovoid, green.
      - D. Plants large, 2-3 m. tall; leaves about 30 cm. long, fuscous-hirsute, especially on the sheaths (Panama). 3. *C. villosissimus*.

- DD. Plants small; leaves about 16 cm. long (Mexico, Costa Rica and Panama)..... 4. *C. hirsutus*.
- CC. Spikes cylindrical, red.
  - D. Appendages of bracts lanceolate, acuminate, upper sterile erect; leaves glabrous (Guatemala and Costa Rica)..... 5. *C. Bakeri*.
  - DD. Appendages of bracts broadly ovate; leaves scabrous (Costa Rica) ..... 6. *C. lima*.
- BB. Bracts of spikes not appendiculate.
  - C. Callose lacking on back of bracts (Costa Rica)..... 7. *C. Malortieanus*.
- CC. Callose present on back of bracts.
  - D. Spike ovoid; leaves sessile (Mexico). 8. *C. pulverulentus*.
  - DD. Spike fusiform (Costa Rica and Guatemala)..... 9. *C. sanguineus*.
- DDD. Spike cylindrical or spherical.
  - E. Plants small, about 2 m. high.
    - F. Leaves glabrous.
      - G. Spike red, cylindrical (Costa Rica and Panama) 10. *C. spicatus*.
      - GG. Spike green, spherical (Guatemala)..... 11. *C. congestus*.
    - FF. Leaves hairy beneath (Costa Rica and Panama)..... 12. *C. nutans*.
  - EE. Plant large, much more than 2 m. high.
    - F. Labellum orange-red with yellow markings (Costa Rica and Guatemala)..... 13. *C. splendens*.
    - FF. Labellum yellow (Costa Rica)..... 14. *C. lusus*.

1. *Costus bracteatus* sp. nov.

Plant clothed with long black hairs; leafy culms up to 2 m. high, the lower leaves reduced to sheathing scales; flowering culms 40 cm. tall, the leaves reduced to sheaths except the four or five uppermost, which bear small blades and closely surround the spike. Uppermost leaves on the sterile culms large and thin, 32 cm. long, 7 cm. wide, oblanceolate, acuminate at the apex and tapering below evenly to an acute base, ferruginous, hairy on both sides, the hairs arising from a bulbous base; midrib slender; venation 3.5/23;\* petioles 1 cm. long, densely ferruginous-tomentose; ligules 5-10 mm. long, tomentose; sheaths

\* This fraction indicates that there are 3.5 primary and 23 secondary veins to the centimeter.

overlapping, spreading-hirsute where exposed and with long appressed needle-like hairs where included in the next lower sheath: lower leaves reduced to sheaths with oblique orifices: sheaths of the flowering culms particularly loose, the uppermost leaves forming a transition to the bracts of the spike. Spike ovate-cylindrical, 13 cm. long, 6 cm. wide, conspicuously bracteate, the bracts oblong, 2-5 cm. long, 1-8 cm. wide, puberulent on the back and along the margins, strigillose within; appendages of the bracts narrowed at the base, ovate, acuminate, rusty puberulent: bracteole on the right side of the flower, conduplicate, 2.5 cm. long, with a linear callose 4 cm. long on the back near the apex, acuminate, rusty-puberulent. Flower 3.5 cm. long; ovary 5 cm. long, three-ribbed, the ribs densely tomentose, the facies less so: calyx 1.3 cm. long, rusty-puberulent, the lobes equal, triangular, 0.3 cm. long, acute: corolla three-lobed, very thin and delicate, nearly equalling the labellum, nearly as broad as long, reddish orange in the upper part: staminodia equalling the labellum, also reddish orange at the tip; stigma spoon-shaped with a notched appendage on the back. [PLATE 12.]

COSTA RICA: in woods on the hillside about a mile south of Siquirres, *H. E. Stork* (*Rowlee & Stork 675*). Specimen preserved in the herbarium of Cornell University.

Only a single mat of the species, including one flowering culm and several leafy culms, was found, although careful search was made for additional material. The plant differs from any other species known to us and is remarkable in its peculiar vesture and delicate texture. It appears to be most closely related to K. Schumann's *Costus Dinklagei* from Cameroon, Africa. The locality where this novelty was found is interesting. The old Spanish trail from the mouth of the Matina River leads westerly along the foot of the mountains to near Siquirres. It then ascends the mountains along the south side of the gorge of the Reventazon River to the central plateau, where the cities of Cartago and San Jose are located. Our plant was found near this trail. There was also found near the same place a spur (for horse-back riding) quite unlike any known to the present generation and probably dating back to the days of the buccaneer.

## 2. *Costus sepacuitensis* sp. nov.

Vegetative and fruiting culms diverse: leafy culms with large elliptic leaves (resembling those of *C. maximus*), at least 30 cm. long and 9 cm. wide, softly pubescent on both sides, margin ciliate; petiole 5 cm. long; ligule 1.5 cm. long, ciliate on the

margin, pubescent on upper part, glabrescent below; venation 5/25: flowering culm at least 30 cm. long, bearing only sheaths, the latter closely embracing the culm, sparsely puberulent. Spike not much exceeding the culm in thickness and appearing like it in texture and in color (dark chestnut in dried specimens): bracts broadly ovate, 4 cm. long, and 3 cm. wide, glabrous, highly polished especially within. Flowers not seen. Fruit obovoid, pubescent, 1.5 cm. long and 0.8 cm. wide, crowned with a deeply parted calyx; calyx lobes unequal, 1.3 cm. long, separated to near the base, ovate, acute. [PLATE 13.]

GUATEMALA: near the Finca Sepacuite, Alta Verapaz, April 13, 1902, *O. F. Cook & R. F. Griggs 596*. Known only from the type specimen, which is in the U. S. National Herbarium.

This remarkable plant is related to *C. geothysus* K. Schum. of Ecuador and *C. erythrocoryne* K. Schum. of Peru but differs from both in the shape and size of the spike, in the calyx, and in the vesture of the plant. Other species with diverse culms occur in South America and in the Eastern Hemisphere.

### 3. *COSTUS VILLOSISSIMUS* Jacq. *Fragm.* 51. *pl.* 80. 1800-1810

Specimens referable to this species from Central America and the West Indies exhibit considerable variation, although agreeing in stature and in having appendiculate green bracts and ovate spikes. The hairiness varies, for example, from tawny shagginess to an almost smooth condition, while the color of the flower varies from sulphur yellow to white. In all cases, however, the margin of the labellum is tinted with pink. The most typical specimen collected by H. E. Stork and the writer is No. 401, found in June, 1918, on the west side of the Panama Canal, opposite Balboa. The flowers are large and showy, the labellum being tubular, about 7.5 cm. and ivory white except for the rose red border. The whole plant and particularly the upper leaves are clothed with long tawny hairs. This specimen was 3 m. tall. Another specimen, also in bloom but only half as tall, is No. 325a, collected in September, 1918, at Quiriga, in Guatemala. It agrees with No. 401 in having tawny hairs and in the color of its flowers.

The species, although apparently rare, is widely distributed in tropical America. The following additional specimens from Central America may be cited: near Balboa, Canal Zone, Panama, *H. Pittier 3776, 3779, 6690*; Province of Alta Verapaz, Guatemala, *O. F. Cook & R. F. Griggs 308*.

4. *COSTUS HIRSUTUS* C. Presl, Reliq. Haenk. 1: 112. 1830

This is a much smaller plant than the foregoing, according to the writer's interpretation, and is evidently not more than 50 cm. high. The spike also is smaller. The following specimen seems to be characteristic: on the cattle trail between the Chiriqui Lagoon and the divide, western Panama, *H. E. Stork* (*Rowlee & Stork 1045*). Another specimen to be associated with the species is the following: upper stretch of the Saraquipi River, *H. Pittier 14166*. Both represent a diminutive *C. villosissimus*. The published descriptions of *C. hirsutus* are meager, and no drawing or photograph of the species has been seen by the writer.

5. *COSTUS BAKERI* K. Schum.; Engler, Pflanzenreich 4<sup>46</sup>: 387. 1904

The following specimens of this species, all from the uplands of central and western Guatemala, have been studied: Barranca del Samalá, Dept. Retalhulen, 1700 ft. alt., *J. Donnell Smith 2801*; Barranca de Eminencia, Dept. Amatitlan, 1400 ft. alt., *J. Donnell Smith 2802* (Type); Volcan Tecuamburro, Dept. Santa Rosa, *J. Donnell Smith 4650*. The following specimen from central Costa Rica has likewise been examined: *A. Tonduz 282*.

*C. Bakeri* is characterized by having a cylindrical and appendiculate spike, more or less red in color; the appendages of the bracts being acute and longer than wide. In these respects it agrees with *C. comosus* (Jacq.) Roscoe, of northern Colombia and Venezuela, a species with which it was originally confused. In *C. comosus*, however, the upper surface of the leaves is softly hairy, while in *C. Bakeri* it is perfectly glabrous. It is probable that intermediates between these two species will be found.

6. *COSTUS LIMA* K. Schum.; Engler, Pflanzenreich 4<sup>46</sup>: 388. 1904

Dr. Schumann apparently knew *C. lima* from the type specimen only, which was collected at the following station on the Pacific side of Costa Rica: near Punta Arenas, January, 1854, *Scherzer*. The species is frequent however, throughout the lowlands in the northern part of Costa Rica, being found also on the Atlantic side. The following additional specimens may be cited: Buenos Aires, near the continental divide, *A. Tonduz 6659*; Livingston on the Reventazon River, *Rowlee & Stork 648*; Siquirres, *Rowlee & Stork 1318*.

It agrees with *C. Bakeri* in having an appendiculate, cylindrical spike, often much shortened, but the color is more brilliantly red, making the spike very conspicuous. The appendages, moreover, differ in being shorter and less striking. The species is further characterized by the peculiar vesture of the very opaque leaves, the upper surface being clothed with shorter bulbous hairs, all pointing toward the apex, while the lower surface is densely covered by a tawny tomentum. The plants are large, often 5-7 m. high, and the spike is about the size of an ear of corn.

According to the original account *C. lima* is related to *C. Friedrichsenii* O. G. Peters., a species described from plants cultivated at Berlin. Dr. Schumann states that it was probably introduced from Central America, but the writer has seen no specimen agreeing with the description.

7. *COSTUS MALORTIEANUS* Wendl. Hamb. Garten- u.  
Blumenzeit. 19: 30. 1863

So far as the writer's observations go *C. Malortieanus* is confined to the coastal plains of northeastern Costa Rica. The type locality is near the Sarapiquí River at the head of navigation, and the original description was drawn from specimens cultivated in Germany. The species grows also along the Reventazon River, where it emerges on to the lowlands. It is the gem of the genus. The plants are small, being less than 1 m. high, and grow in wide spreading mats, flowering in July and August. The flowers, which are not freely produced, are very beautiful, suggesting in their tints some of the tropical orchids. The leaves are broadly obovate, densely hairy, and obscurely variegated with darker and lighter threads of green. Specimens in the greenhouses of the New York Botanical Garden, although under cultivation for several years, have not as yet produced flowers.

Two other species of tropical North America with unappendaged bracts and no callose have been described under the names *C. pictus* D. Don, and *C. mexicanus* Liebm. Specimens of the first two have not been found by the writer, but both are apparently of Mexican origin, *C. pictus* being based on plants grown in England.



8. *COSTUS PULVERULENTUS* C. Presl, Reliq. Haenk. 1:41. 1830

The original specimen of *C. pulverulentus* was collected in Mexico by Haenke, no more definite locality being mentioned. The writer has identified with it, somewhat doubtfully, the following specimen from Guatemala, originally referred to *C. Malortieanus*: Rio Sis, Dept. Suchitepequez, 1300 ft. alt., *J. Donnell Smith 2800*. This and the following six species agree in having a callose on the back of the bracts.

9. *COSTUS SANGUINEUS* Donn. Sm. Bot. Gaz. 31: 122. 1901

This species is the most frequent representative of the genus in northern Costa Rica, and a photograph of it has been reproduced in Calvert's "A year of Costa Rican Natural History," opposite page 257, under the incorrect name *C. Malortieanus*. It is not found on the beach but inhabits higher ground, often at an elevation of as much as 2000 feet. The type specimen was collected in 1901, at Cubilquitz, Dept. Alta Verapaz, Guatemala, about 1000 ft. alt., by H. von Tuerckheim (No. 7686), but the species has been found in other Central American countries bounding the Caribbean Sea. The following specimens may be cited: Peralta, *Rowlee & Stork 45*; Livingston on the Reventazon River, *Rowlee & Stork 653*; and Siquirres, *Rowlee & Stork 1311, 1312*. The plant is about 1.5 m. high, and the leaves are softly pubescent. The red spikes are fusiform and acute, when perfectly developed, as shown in Calvert's figure, but they are frequently deformed and much shortened.

10. *COSTUS SPICATUS* (Jacq.) Sw. Prodr. Fl. Ind. Occ. 11. 1788

The original material of *C. spicatus* came from the West Indies, where the species is widely distributed. It is found, also, in the close vicinity of the seashore in northern Costa Rica, between Limon and the mouth of the Matina River. The following specimens may be referred to it: Chargres, 1850. *A. Fendler 446*; Rio Dulce, March, 1889, *J. Donnell Smith*; vicinity of Frio, province of Colon, August, 1911, *H. Pittier 4137*; Limon, *Rowlee & Stork 674*. The field notes that follow were made from No. 674.

Culms 1-2 m. high, many from a rather dense mat, leafy to near the base, whole plant glabrous. Leaves 18 cm. long, 7 cm. wide, elliptic, short-acuminate

at the apex, subauriculate at the base, shining green above, glaucous beneath, petioles 6 mm. long, sheath shorter than the internodes, ligule 5 mm. long, three or four leaves approximate to the base of the spike, venation 7735. Spike oblong, 7 cm. long, 2.3 cm. thick, very compact. Bracts nearly orbicular, 2.5-3 cm. in diameter. Bracteole 1.5 cm. long, relatively broad, boat-shaped, dextrad. Ovary 5 cm. long, glabrous, subtrigynous, seeds very numerous, angular with elater-like aril. Calyx 5 cm. long, campanulate and with very short broad lobes and red margins. Corolla orange-red, 2 cm. long, dilated at the apex, lobed to the middle, lobes oblong, acute. Labellum 3 cm. long, obovate, subtrilobed, yellow. Stamen 2.5 cm. long, lanceolate, obtuse, anther adnate above the middle.

#### 11. *Costus congestus* sp. nov.

Stem less than 1 m. high. Leaves crowded near the summit; petioles 5 cm. long; blade 24 cm. long, 6 cm. wide, acuminate at the apex, tapering from above the middle toward the base, slightly glaucous beneath, green above, glabrous throughout. Spike spherical, about 4 cm. in length and breadth; lower bracts with leafy appendages; bract proper orbicular, red, with a callose line. Ovary glabrous, 4 mm. long; calyx divided to the base, the lobes unequal, oblong, rounded, at the apex; petals large, hyaline, obtuse; labellum 4 cm. long. [PLATE 14.]

GUATEMALA: Escuintla, 1100 ft. alt., March, 1890, *J. Donnell Smith* 2036 (Type); Santa Lucia, Dept. Escuintla, 1045 ft. alt., March 3, 1905, *W. A. Kellerman* 5284; Santa Barbara, Dept. Solola, 1370 ft. alt., August, 1891, *J. Donnell Smith* 137. Type specimen in the herbarium of Cornell University.

MEXICO: vicinity of Choapam, Oaxaca, 3800-4500 ft. alt., July 28, 1894, *E. W. Nelson* 911.

The species is glabrous in all its parts. It differs from *C. spicatus* (Jacq.) Sw., to which Baker referred some of the specimens, in the size of the flower and in the shape and size of the spike.

#### 12. *COSTUS NUTANS* K. Schum.; Engler, *Pflanzenreich* 4<sup>46</sup>: 407. 1904

The type material of *C. nutans* came from the following locality: near Aguacate, Costa Rica, September, 1857 (in flower), *C. Hoffman* 727.

The only specimen seen by the writer was collected on Mount Pirri, Panama, on June 12, 1912, by E. A. Goldman (No. 1963) at an altitude of 1350 m. [PLATE 15.]

13. *COSTUS SPLENDENS* Donn. Sm. & Tuerckheim; Donnell Smith, Bot. Gaz. 33: 260. 1902

*Costus maximus* K. Schum.; Engler, Pflanzenreich 4<sup>46</sup>: 405. 1904.  
*Costus giganteus* Kuntze, Rev. Gen. 2: 687. 1891. Not Ridley, 1887.

The species was based on a specimen collected in Guatemala at an altitude of 350 m., by H. von Tuerckheim (No. 8015), no more definite locality being mentioned. The writer has not seen the type specimen, but other material collected in Guatemala by Von Tuerckheim and referred to *C. splendens* has been available for study. In this material the bracts bear a callose below the apex, although no structure of this sort is mentioned in the original description. Since these specimens are indistinguishable from *C. maximus* K. Schum., the name *C. splendens* will have to supplant the later name *C. maximus*, and the known range of the species will extend from Guatemala to Panama.

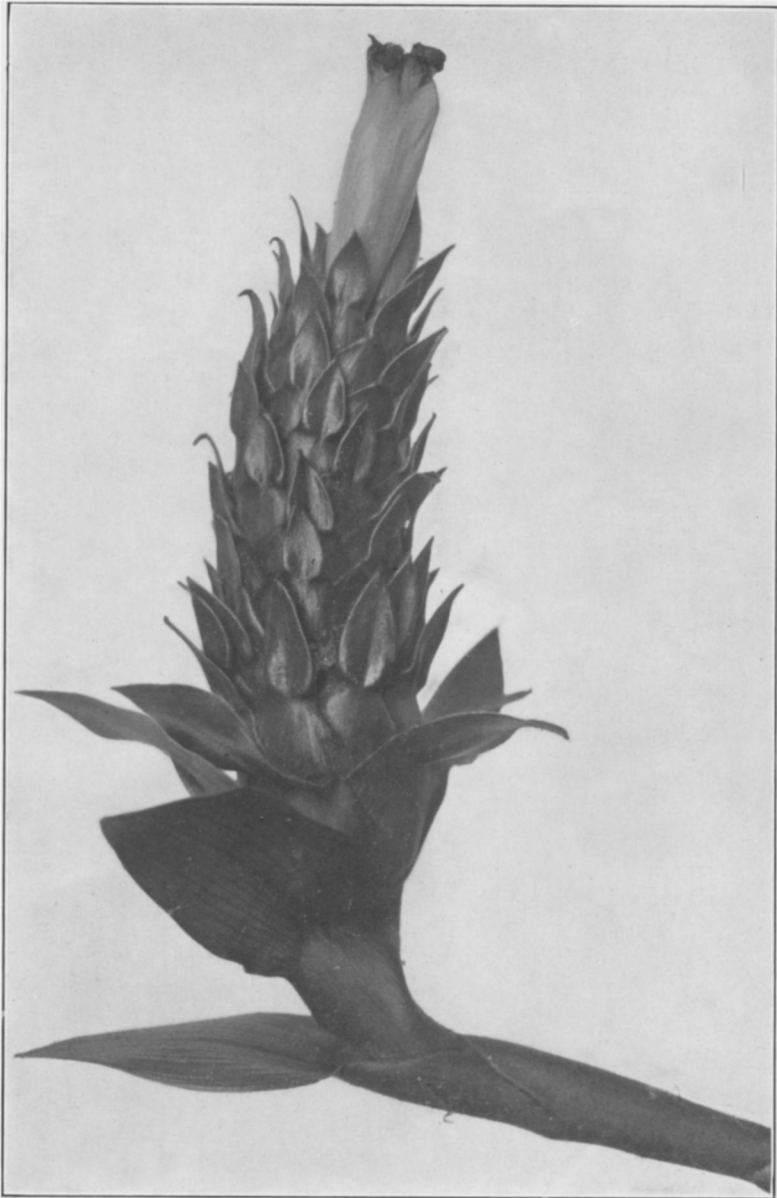
14. *COSTUS LAXUS* O. G. Peters.; Martius, Fl. Brasil. 3<sup>3</sup>: 56. 1890

The type specimen was collected in Costa Rica by Aented in 1847, the name of the locality being illegible. The species is known also from Venezuela.

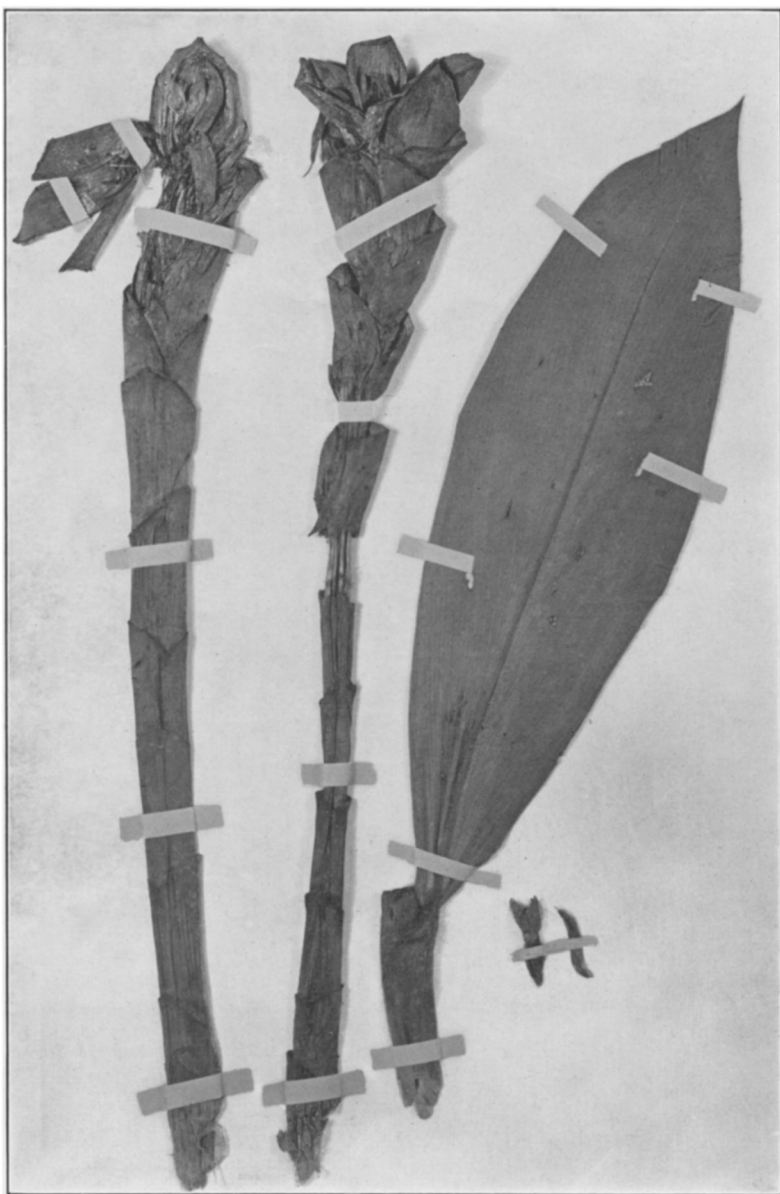
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#### Explanation of plates 12-15

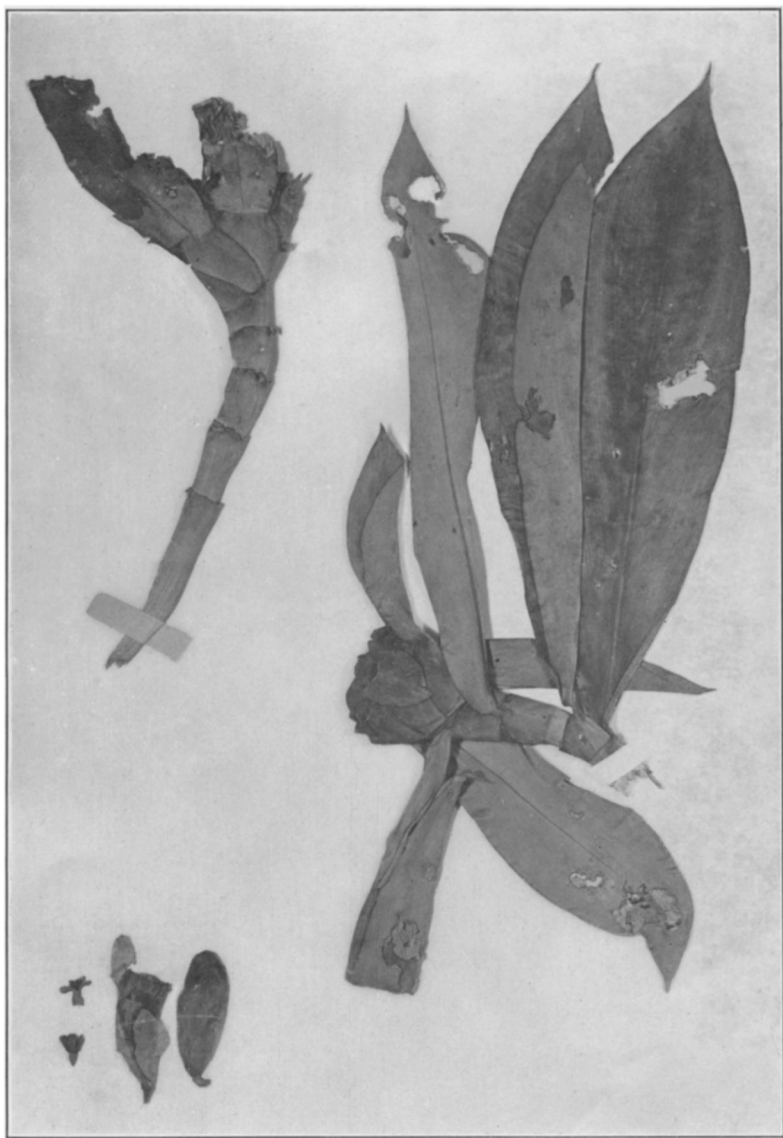
- PLATE 12. *COSTUS BRACTEATUS* Rowlee.  
 PLATE 13. *COSTUS SEPACUITENSIS* Rowlee.  
 PLATE 14. *COSTUS CONGESTUS* Rowlee.  
 PLATE 15. *COSTUS NUTANS* K. Schum.



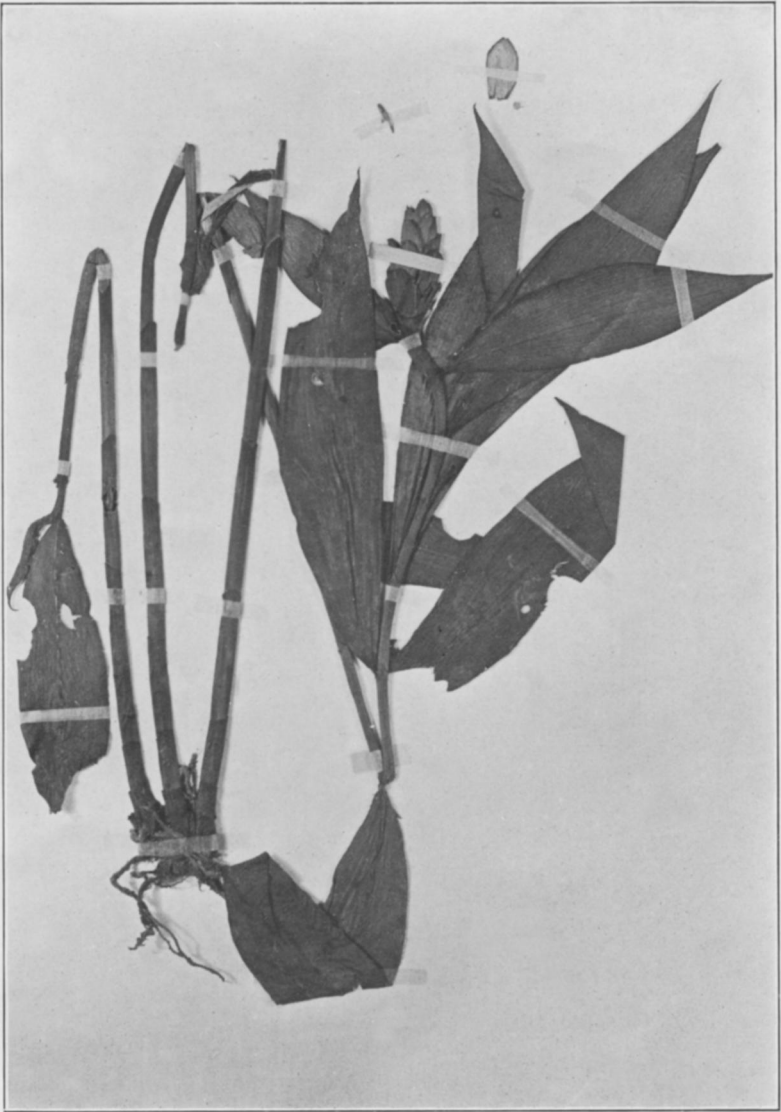
*COSTUS BRACTEATUS* ROWLEE



*COSTUS SEPACUITENSIS* ROWLEE



COSTUS CONGESTUS ROWLEE



COSTUS NUTANS K. SCHUM.